Client Learning and the Performance of Collaborative Infrastructure Projects

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Abstract

Australia is a leading user of collaborative procurement methods, which are used to deliver large and complex infrastructure projects. Project alliances, Early Contractor Involvement (ECI), and partnering are typical examples of collaborative procurement models. In order to increase procurement effectiveness and value for money (VfM), clients have adopted various learning strategies for new contract development. However client learning strategies and behaviours have not been systematically analysed before. Therefore, the current paper undertakes a literature review addressing the research question "How can client learning capabilities be effectively understood?".

From the resource-based and dynamic capability perspectives, this paper proposes that the collaborative learning capability (CLC) of clients drives procurement model evolution. Learning routines underpinning CLC carry out exploratory, transformative and exploitative learning phases associated with collaborative project delivery. This learning improves operating routines, and ultimately performance. The conceptualization of CLC and the three sequential learning phases is used to analyse the evidence in the construction management literature. The main contribution of this study is the presentation of a theoretical foundation for future empirical studies to unveil effective learning strategies, which help clients to improve the performance of collaborative projects in the dynamic infrastructure market.

Key words: Absorptive capacity; Dynamic capabilities; Collaborative projects; Value for money; Project performance Infrastructure; Learning routines.

Introduction

Collaborative procurement methods have been applied by the Australia infrastructure industry to deliver large and complex infrastructure projects (Morwood, Scott and Pitcher 2008). Project alliances, Early Contractor Involvement (ECI), and partnering have been the typical collaborative procurement models applied by the industry in the past fifteen years (Kelly 2011). The procurement methods have evolved to suit the changing economic conditions under the impact of the Global Financial Crisis in 2008 (Kelly, 2011). Clients have adopted various learning strategies to manage the challenges of economic uncertainty. As a result, new

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procurement models have been developed to increase procurement effectiveness and value for money (VfM) (Kelly 2011). However clients' learning strategies and behaviours have not been systematically studied. Therefore the research question underpinning the current literature review is: "How can client learning capabilities be maximised?". The objective is to provide a theoretical foundation that guides clients' understanding of the means to improve their contribution to project outcomes.

From the resource-based perspective, clients use collaborative projects as a special vehicle for resource configuration, i.e., to better leverage the resources and capabilities of participant organisations for value maximization during infrastructure construction. Following this perspective, the current study applies the theoretical assertions of the resource-based view (Barney 1991) and the dynamic capabilities' view (Helfat et al. 2007; Lewin, Massini and Peeters 2011) to conceptualize the collaborative learning capability (CLC) of construction organisations, and the exploratory, transformative and exploitative learning phases underpinning CLC.

The conceptualization is subsequently used to identify the evidence in the construction management literature about the strategic objectives of clients' learning strategies on collaborative projects. The analysis also identifies learning routines adopted by clients to undertake three sequential learning phases for operating routine reconfiguration and ultimately performance maximisation. These phases are (1) explorative; (2) transformative; and (3) exploitative. The paper is concluded by highlighting several essential research needs for future empirical investigation. This study prepared a theoretical foundation for future empirical studies to unveil the effective learning strategies, which help clients to improve the performance of collaborative projects in the dynamic infrastructure market.

Methods

The study examined the management literature on the dynamic learning capability concept (Lewin, Massini and Peeters 2011; Lichtenthaler and Lichtenthaler 2009) to develop a conceptual foundation for understanding client learning behaviour. The review drew on recent research advances in dynamic capabilities (e.g. Zollo and Winter 2002; Teece 2007; Helfat et al. 2007), absorptive capacity (e.g. Cohen and Levinthal 1990; Lane, Koka and Pathak 2006; Lewin, Massini and Peeters 2011; Zahra and George 2002), knowledge management (e.g. Nonaka 1994; Grant 1996; Nonaka and von Krogh 2009), the cognitive theory of the firm (Nooteboom 2009, 2007), and strategic alliance management (e.g. Das and Teng 2000; Grant and Baden-Fuller 2004; Kale and Singh 2007). These research areas have developed from the foundation theories of evolutionary economics (Nelson and Winter 1982) and the resource-based view (Wernerfelt 1984; Barney 1991).

Following this, the Australian empirical context was outlined as a leading example in the use of collaborative procurement for infrastructure projects. Against this background, the value of the conceptual foundation was examined in relation to collaborative infrastructure projects. These last two steps were achieved through interpretation of the construction management literature. The review considered leading construction management journals, government reviews and industry reports published over the period 2005 to 2012, which covers the most active period in the use of collaborative contracts.

Conceptual Background

CLC is a special dynamic capability deliberately developed by construction organisations to carry out joint learning in collaborative projects. This capability is structured and persistent, and builds on micro-foundations of high-order learning routines. The routines carry out organisational learning to explore, transform and exploit knowledge both inside and outside organisational boundaries to reconfigure organisational knowledge resources (Lewin, Massini and Peeters 2011). From the evolutionary perspective (Nelson and Winter 1982; Zollo and Winter 2002), the high-order learning routines are search routines that develop the operating routines of collaborative projects. Project operating routines are relatively static and effect project performance *in the short term*. Functioning at the strategic level, high-order learning routines constantly match the operating routines with dynamic environments to enhance project performance *in the future*. As both not-for-profit and for-profit organisations may face and/or initiate changes (Helfat et al. 2007), the conceptualization of CLC applies to not-for-profit organisations, such as public sector clients, and for-profit organisations such as private sector clients and construction firms.

CLC is organisation specific and idiosyncratic due to the tacit nature of knowledge (Nonaka and von Krogh 2009) and complexity of cognitive learning (Nooteboom 2009). Within its micro-foundations, the complex interdependences and complementarities of high-order learning routines are usually imperfectly imitable (Lewin, Massini and Peeters 2011). The configurations of learning routines depend on the unique evolutionary history of an organisation (Lewin, Massini and Peeters 2011; Zollo and Winter 2002). Causal associations between learning routine configurations and project performance are usually ambiguous (Zollo and Winter 2002). Therefore, from the resource-based perspective (Barney 1991), CLC can be perceived as imperfectly imitable resources that help to sustain organisational competitive advantage and cause project performance heterogeneity. Hence, the investigation into the learning routine configurations is essential for understanding the latent concept of CLC and its performance implications which reflect its value-maximizing potential.

External learning routines that recognize, assimilate and apply new knowledge from an external environment has been the focus of attention in the conventional absorptive capacity literature (e.g. Cohen and Levinthal 1990; Zahra and George 2002). The literature of knowledge management (e.g. Nonaka 1994) and dynamic capabilities (e.g. Zollo and Winter 2002) traditionally focus on internal learning routines. These routines facilitate variation and new idea generation, dissemination and combination of internally generated knowledge, and use such knowledge to update old routines. Knowledge acquired from external sources needs to be selected, codified and internalized through internal learning routines to improve operating routines (Lewin, Massini and Peeters 2011). Therefore, learning-related dynamic capabilities should be conceptualized with both external and internal learning routines that carry out exploratory, transformative and exploitative learning for the reconfiguration of operating routines (Lewin, Massini and Peeters 2011).

Along these lines, this study proposes three sequential learning phases underpinneing the CLC of construction organisations. These phases are (1) explorative; (2) transformative; and (3) exploitative. ***Exploratory learning*** allows construction organisations to acquire and create new knowledge from both internal and external sources for collaborative project delivery. ***Transformative learning*** enables the organisations to select, retain, disseminate, and codify both internally generated and externally acquired new knowledge. ***Exploitative learning*** helps the organisations to integrate the new knowledge into the existing project operating routines,

so as to refine and extend those existing routines and technologies. The conceptualization of CLC and the three learning phases provide the theoretical foundation upon which to analyse the evidence in the construction management literature with regard to the influence of clients' learning on the performance of collaborative infrastructure projects.

Empirical Context: Australia as a World Leader

Australia is a world leader in the development of collaborative delivery systems for infrastructure provision (Kelly 2011; Morwood, Scott and Pitcher 2008). In Australia, the public sector has dominated the market for collaborative infrastructure construction, and also drives the evolution of the procurement models (Morwood, Scott and Pitcher 2008; Kelly 2011). The public sector clients use collaborative procurement approaches to serve a broad community and environmental focus, and in particular, manage relatively high risks (Morwood, Scott and Pitcher 2008; Department of Infrastructure and Transport 2010). From late 1990s to 2007, pure project alliancing effectively became the default procurement model, and was used to deliver about 500 public infrastructure projects, representing one-third of the total value of the public sector projects of the nation (Kelly 2011; Morwood, Scott and Pitcher 2008). The Global Financial Crisis in 2008 brought economic uncertainty, which prompted a review of the alliancing model's effectiveness for achieving the clients' VfM (Department of Treasury and Finance 2009, 2011). Since then, the Australian infrastructure industry has witnessed a learning process jointly carried out by the clients and construction firms (Kelly 2011). This collaborative learning has led to the emergence of various new procurement models, e.g. price-competitive alliancing, price-competitive ECI, early tender evolvement contract, and preferred tender contracts (Mignot 2012; Kelly 2011).

Even under the recent constrained economic conditions, the public sector clients have been willing to use collaborative procurement models to deliver complex infrastructures (Kelly 2011). These projects usually involve high risks, tight time constraints, greater cost certainty, and often demand greater community and stakeholder engagement (Kelly 2011). In contrast to the fragmented traditional project procurement models (e.g. lump sum contract), collaborative methods enable development of relationships that connect construction organisations more tightly and intensively in a supportive project environment. In this environment, knowledge is integrated through informal relationships, in addition to a contractual commitment (Davis and Walker 2009).

Collaboration between construction organisations improves the management of risks and uncertainties associated with various project phases such as development, design, construction, environmental and lifecycle issues (Lahdenperä 2012; Morwood, Scott and Pitcher 2008). Collaborative procurement approaches thus allow public sector clients to benefit from much better knowledge sharing and exchange, and ultimately a much higher level of knowledge creation and innovation than during traditional adversarial delivery methods (Love, Mistry and Davis 2010; Hauck et al. 2004). Greater organisational learning also leads to the continual emergence of new forms of collaboration which align with the different phases of the procurement process, e.g. planning alliances, design alliances, and collaborative road maintenance contracts (Kelly 2011). However, for public sector clients, the triggers for contractual reorientation are often the outcomes of government-sponsored reports and changed governance policies (Hartmann, Davies and Frederiksen 2010; Kelly 2011). Thus the internal evolutionary learning process that is required to build capability is often

interrupted by the need to react to external political pressure (Hartmann, Davies and Frederiksen 2010; Kelly 2011).

Private sector clients have moved towards collaborative methods more recently in the infrastructure industry, driven by increasing expectations in community, stakeholder and environmental outcomes (Morwood, Scott and Pitcher 2008). The strategic objectives thereof within the private client context are to serve shareholder interests (Leiringer, Green and Raja 2009), increase strategic flexibility and sustain competitive advantages in the infrastructure market (Morwood, Scott and Pitcher 2008; Miller et al. 2009). These drivers are different from those of the public sector clients, who need to respond to community demands infrastructure or regulation changes (Kelly 2011). The private sector clients take a more rigorous approach in the development of business cases in order to provide returns to shareholders (Morwood, Scott and Pitcher 2008). They take into account all costs and revenue flows in developing financial models (Miller et al. 2009), and place greater emphasis on qualitative performance measurement areas to ensure positive stakeholder relationships (Morwood, Scott and Pitcher 2008). In addition, private sector clients seem to favour a sole source or single tenderer selection to allow in-depth collaboration and learning through design and construction (Ross 2008), which is different from the price competition strategies of public sector clients (Department of Infrastructure and Transport 2011).

Using the Conceptual Foundation to Understand Client Behaviour

Organisational learning enables clients to manage the contingencies involved in transaction relationships, and to create socially complex routines to sustain inter-organisational relationships (Miller et al. 2009). Clients develop their project operating routines through different learning paths and by adopting diverse learning routine configurations (Edwards 2008; Miller et al. 2009). Some organisations focus on the exploration of alternative contracts, and adopt an exploratory learning strategy; some place emphasis on the exploitation of standardised contracts, thus employing an exploitative learning strategy (Hartmann, Davies and Frederiksen 2010). From a cognitive organizational learning perspective (Nooteboom 2009), the essential role of an organisation is to balance knowledge exploration and exploitation within its specific context. Transformative strategies help to provide this balance, which facilitate contract creation, application and development (Morwood, Scott and Pitcher 2008). As a result of the balance achieved, the overall learning strategy could be mainly exploratory or exploitative to encourage innovation and ensure adaption efficiency at the same time (Nooteboom 2009). The creative combination of learning routines is required to manage the challenges associated with initiating a contract form, building up a relationship with service providers, and tailoring the contract to the local environment (Love, Mistry and Davis 2010; Hauck et al. 2004; Davis and Walker 2009). Based on the evidence in the construction management literature, the following sections present a synopsis of client learning routines interpreted according to the conceptualization of the three sequential learning phases.

Exploratory Learning Routines

In the exploratory learning stage, clients provide communication mechanisms such as organisational forums and workshops for their staff members who work with collaborative contracts, to allow them to articulate and exchange their experiences (Morwood, Scott and Pitcher 2008). Some organisations adopt a more decentralised and exploratory approach to contract development. This approach involves intensive and informal cooperation between

staff members in the contract application process, where a bottom-up pilot project is often used to explore contract elements specific to a certain transactional context (Hartmann, Davies and Frederiksen 2010). In addition, clients need to identify and acquire knowledge from external sources to drive the evolution of collaborative contract frameworks. Information about the evolutionary trend of collaborative projects is identified through networking and interactions with industry partners (Love, Mistry and Davis 2010). External specialist advisors are essential sources of knowledge. External consultants may be engaged by clients to provide a wide range of professional services, such as commercial, transactional, legal and probity advice, financial audit, independent verification, owner estimations and behavioural coaching (Department of Infrastructure and Transport 2011). By involving advisors in various stages of the procurement process, clients are able to leverage knowledge assets from other leading-edge clients and industries that are serviced by those advisors (Morwood, Scott and Pitcher 2008).

Transformative Learning Routines

In the transformative learning stage, tacit knowledge such as experience, best practice and problem-solving solutions that are obtained from both internal and external sources are shared within client organisations (Morwood, Scott and Pitcher 2008). This newly assimilated knowledge is codified and used to update artefacts such as standards, check lists, guidelines, manuals and databases (Anumba, Egbu and Carrillo 2005). Some clients use organisational level auditing systems to capture the learning outcomes from prior collaborative projects, and use this knowledge to improve existing generation of contracts or to develop entirely new contracts (Hartmann, Davies and Frederiksen 2010). In Australia, the public policy documents that guide the procurement process differ markedly between states (Raisbeck, Duffield and Xu 2010). These documents codify the learning outcomes of public sector clients in different regional contexts (Miller et al. 2009). The public sector clients of the Australian states also undertake joint learning projects.

Exploitative Learning Routines

In the exploitative learning stage, clients help their staff to internalise transformed knowledge through training. Internal training programs are provided for staff members who start with new collaborative projects, in particular to advise them as to what to expect during the implementation of new forms of contract devised in the transformative learning phase (Hartmann, Davies and Frederiksen 2010). Internal training courses and workshops address: the technical aspects of new contracts; collaborative attitudes and behaviours; as well as relationship building with service providers (Hartmann, Davies and Frederiksen 2010; Walker and Lloyd-Walker 2011). Staff members that have collaborative contracting experience are encouraged to mentor and share knowledge with those who have less experience (Morwood, Scott and Pitcher 2008). External facilitators/behavioural coaches are involved in the training, and help guide knowledge sharing discussions (Morwood, Scott and Pitcher 2008). To prepare for new collaborative projects, experienced staff members participate in the contract development process and help to draft and shape the final format of new contracts (Hartmann, Davies and Frederiksen 2010). The contract creation, application and development process of a new collaborative project provides an opportunity for interaction among members of contract teams and renews the cycle of knowledge generation (Leiringer, Green and Raja 2009). These routines provide the opportunity for learning from prior collaborative contract implementation that is transferred to new projects (Miller et al. 2009). In general, exploitative learning routines enable clients to overcome the learning barriers

caused by the temporary coalitions of participant organisations in collaborative projects (Reichstein, Salter and Gann 2005). Exploitative learning ensures that knowledge gained from one project through exploratory and transformative learning can be used to create and modify project operating routines of anther project for value maximisation.

Conclusions

Clients use collaborative infrastructure projects to achieve two strategic objectives. The first is to obtain imperfectly mobile, imitable and substitutable resources, which are unlikely to be acquired through other transactional forms (e.g. traditional construction contracts). This is because the development of unique resources is the result of inter-discplinary collaboration which is not enabled in traditional contracts. The second is to use the obtained valuable resources to reconfigure their organisational resource-base to achieve value maximization in the changing infrastructure market. The effectiveness of the resource configuration in the long run is determined by how the clients develop their CLC, which is a latent concept. Therefore the influence of CLC on the performance of collaborative projects needs to be understood through studying the performance implications of its underlying learning routines.

It is evident from the construction management literature that clients explore both internally generated and externally acquired knowledge, transform the knowledge in both tacit and explicit forms, and exploit the knowledge to modify and create new routines to manage collaborative projects. The assessment of the construction management literature also revealed several research issues that need to be resolved by future empirical studies. First, how do clients configure the learning routines of each learning phase, and develop the interdependence and complementarities between the three learning phases? Second, how are the learning routine configuration and learning phase designed to balance exploratory and exploitative learning in collaborative infrastructure construction? Third, how do the contingent factors, such as client organisation's own organisational governance mechanisms, and their relationships with other stakeholders - the participant construction firms in particular - affect their decisions in achieving the balance? Finally, how do the exploratory and exploitative orientated learning strategies help clients to continuously improve operating routines in various collaborative procurement models for value and performance maximization?

The conceptualization of CLC and three learning phases in this paper provide a theoretical foundation for these future empirical studies. The studies have potential to discover the effective learning strategies clients use to improve operating routines of collaborative projects, which are governed by various procurement models for performance maximization. Further, this paper only discusses the project performance heterogeneity from the resource and capability perspectives. In the future, this theoretical approach can be integrated with the transactional cost approach (Williamson 1979) to further reveal the impact of learning on the evolutionary path of collaborative procurement methods.

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